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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XXI Number 6

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DISCOVERY OF THE SUGAR BEET LEAFHOPPER IN ASSOCIATION WITH BRITTLE ROOT OF HORSERADISH IN ILLINOIS

A disease of horseradish termed "brittle root" by the growers, has been known in Illinois for several years but usually causes small losses. Last year K. J. Kadow and H. W. Anderson reported a destructive outbreak in the St. Louis horseradish-growing area. (P.D.R. 20:288. 1936).

The cause of the disease is unknown. According to Kadow and Anderson "In every essential respect the disease is identical with curly top of beets on horseradish as described by Severin." The insect vector of curly top, the sugar beet leafhopper, had never been reported from Illinois.

D. M. DeLong and K. J. Kadow report in the Journal of Economic Entomology (The sugar beet leafhopper, Eutettix tenella Baker, appears in Illinois. Jour. Econ. Entom. 30:210. 1937) that a collection of leafhoppers made last October at Collinsville, Illinois, from horseradish plants affected by brittle root, shows a large proportion of the sugar beet leafhopper, besides a few specimens of two other species. They state that the only previous collection of E. tenella in the East (on sea purslane at Miami, Florida, DeLong, Jour. Econ. Entom. 18:637. 1925) caused no concern, but "This latter finding may be of some consequence because of its proximity to the eastern sugar beet area."

The finding of the known vector of curly top in association with a disease so closely similar to curly top as it affects horseradish in the West strengthens the possibility that brittle root in Illinois actually is identical with curly top, but of course it cannot be assumed that they are the same until that has been proved by experiment to be the case.

THIRD EXPERIMENTAL FORECAST OF THE INCIDENCE OF BACTERIAL WILT OF CORN

Neil E. Stevens

The Purpose of the Forecasts

The purpose of these experimental forecasts is to test the validity of the hypothesis that a relation exists between the incidence of bacterial wilt of corn in a given locality and the temperature of the preceding winter. Their publication is, of course, attended by some risk, particularly if growers consider them in formulating their planting plans. On the other hand, to prepare such forecasts in the spring and then seal them, marked "not to be opened until Christmas", seems a rather dull procedure and their publication certainly seems to help sustain interest in recording the yearly incidence of the disease. Indeed, if they serve no other purpose than this,

their publication may well be justified.

Plant diseases almost invariably attract most attention during periods of great or increasing severity. Records, even of their rate of decline, are in most cases woefully incomplete. Our knowledge of the relations between plant diseases and environmental conditions is more likely to be gained from experiments and observations relating to the production of epidemics than to the growing of healthy plants. This is due in part, no doubt, to the almost traditional preoccupation of plant pathologists with the disease and its causal organism rather than the crop plant. It seems highly probable, however, that periods during which the host plant rather than the disease is gaining ascendency might offer a real opportunity to increase our knowledge of conditions favoring the control of plant diseases. Losses from bacterial wilt of corn have been decreasing since 1934. However, the continued interest and cooperation of numerous investigators has made possible a reasonably adequate record of the incidence of the disease in the eastern United States up to and including 1936. If this interest can be maintained and the records kept reasonably complete until another epidemic, a real contribution to the history, if not to the understanding, of plant disease in the United States may be made.

In the fall of 1934 (P.D.R. 18:141-149), the writer raised the question as to whether the severity of bacterial wilt in the northeastern states in a given year might not be in some way related to the temperature of the preceding winter. This idea was suggested by the reduction in severity that followed the cold winter of 1933-34. On the basis of the very limited evidence available, it was suggested as a working hypothesis that the disease would be of little commercial importance in the northeastern United States following a winter with a temperature index below 90 and present in destructive amounts following a winter with an index above 100, with intermediate conditions following winters between 90 and 100, "winter index" being a simple sum of the mean temperatures for December, January, and February.

Obviously such an hypothesis is not susceptible of experimental test, but must wait for confirmation or refutation on continued observation. However, the weather conditions of the winters of 1935-36 and 1936-37, together with those immediately preceding, furnish what amounts to a gigantic experiment on the apparent effect of markedly changed winter temperatures in a region where bacterial wilt had been abundant during a number of recent years. Of course, no "control" areas are available. On the other hand, this "experiment" is not subject to the criticism leveled by Whitehead (Adventures of Ideas, p. 111) at scientific experimentation in general as being "nothing else than a mode of cooking the facts for the sake of exemplifying the law."

Unfortunately for the progress of this study, though quite the contrary for the industry, observation as to the incidence of bacterial wilt

is being seriously handicapped by the success of the plant breeders in producing varieties of sweet corn combining excellent quality with a satisfactory degree of resistance to the disease. According to present information, there is available for this year enough seed of Golden Cross Bantam alone to plant more than 250,000 acres, and a number of other very desirable hybrids are on the market in quantity. There appear to be no figures of the total acreage of sweet corn in the United States. "Agricultural Statistics" for 1936 gives the acreage of sweet corn "for manufacture" in 1935 as 399,300 acres. The 1930 census gives 483,053 acres of sweet corn raised "for sale". Even if as much as 15 or 20 percent be added as an estimate of the acreage in home gardens, it is evident that hybrids will dominate the sweet corn plantings this year. Since almost all of the hybrids offered for sale show more resistance to bacterial wilt than the open-pollinated yellow varieties which they will largely replace, conclusions as to the incidence of bacterial wilt in 1937 must be based chiefly on home plantings, very early market gardens, and experimental plantings. Obviously these cannot entirely replace, as a basis for conclusion as to the distribution of this disease, 300,000 acres of susceptible sweet corn scattered over a dozen states.

The Incidence of Bacterial Wilt in 1936 and the Temperature of the Preceding Winter

The course of recent winter temperatures in different regions can be followed for certain important localities in Fig. 12 or in greater detail by reference to the maps, P.D.R. 18:144-149 and P.D.R. 20:110-111. As is evident from the curves, the "winter index" during recent years was above 100 at New Haven, Connecticut, in two winters, and at Indianapolis, Indiana, in three. In both localities bacterial wilt of corn was severe in the summers following those winters, and at no other time during the period. On the other hand, the winter index for Washington, D.C. remained above 100 until 1935-36 when it dropped to 92. The following summer, losses from bacterial wilt in this area were decidedly reduced for the first time in recent years.

Because of the experimental work at Arlington Farm, Virginia (directly across the river from Washington), records of the disease there are particularly dependable. Regarding the incidence of bacterial wilt at Arlington Farm in 1936, Miss Elliott says (P.D.R. 20:250-251),

> "During most seasons at Arlington Farm, susceptible varieties of sweet corn are so heavily infected with bacterial wilt that very few marketable ears of corn are produced. Many of the plants are killed by the disease and most of the remaining plants show moderate to heavy infection. Plots of such susceptible varieties appear to be ruined by the disease. During the 1936 season at Arlington

> Farm susceptible varieties have made good stands and have produced a fair crop of marketable ears. Early infection was much less abundant than in previous years and as a result the number of plants killed by the disease was comparatively low. There was a decided increase in amount of infection as the season progressed but this infection was limited largely to leaf lesions which did not prevent development of a fair crop of marketable ears."

This may be contrasted with the report of conditions in 1934 after the marked reduction in losses farther north (P.D.R. 18:122).

> "VIRGINIA (northern portion): In Arlington and Fairfax Counties, Virginia, Stewart's disease seems to be as severe as in 1932 and 1933. In certain gardens where Golden Bantam has been grown each year the losses are greater this season. At Arlington Farm two lots of Golden Bantam grown from seed produced in Maine and Idaho showed, on August 2, practically every plant infected and 50 percent and 35 percent, respectively, of plants killed by the disease."

North of the Potomac and Ohio Valleys and throughout the states in which surveys were made, that is, Indiana to New England, bacterial wilt was of little importance in 1936. It has, indeed, been of little importance since the summer of 1933. During the last six years at least, the correlation between the observed abundance of bacterial wilt in this region and the temperatures of the preceding winters is too striking to require comment and seems to warrant another forecast covering a wider territory than the preceding ones, even though, as was pointed out when this hypothesis was first suggested (P.D.R. 18:147), "It is extremely unlikely that so simple an explanation can be wholly adequate to account for the variation in the amount of the disease".

Temperatures of the Past Winter and Forecast for 1937

The temperature indices for the winter of 1936-37 at a number of stations in the northeastern United States are given in Fig. 13. Detailed comparison with recent winters may be made by referring to maps already published (P.D.R. 20:110-111 and P.D.R. 18:144-149). The general trend is clearly indicated by the curves drawn for three representative stations, Fig. 12.

Throughout the area the winter of 1936-37 was much warmer than that of 1935-36. In Indiana temperatures of the past winter were only slightly

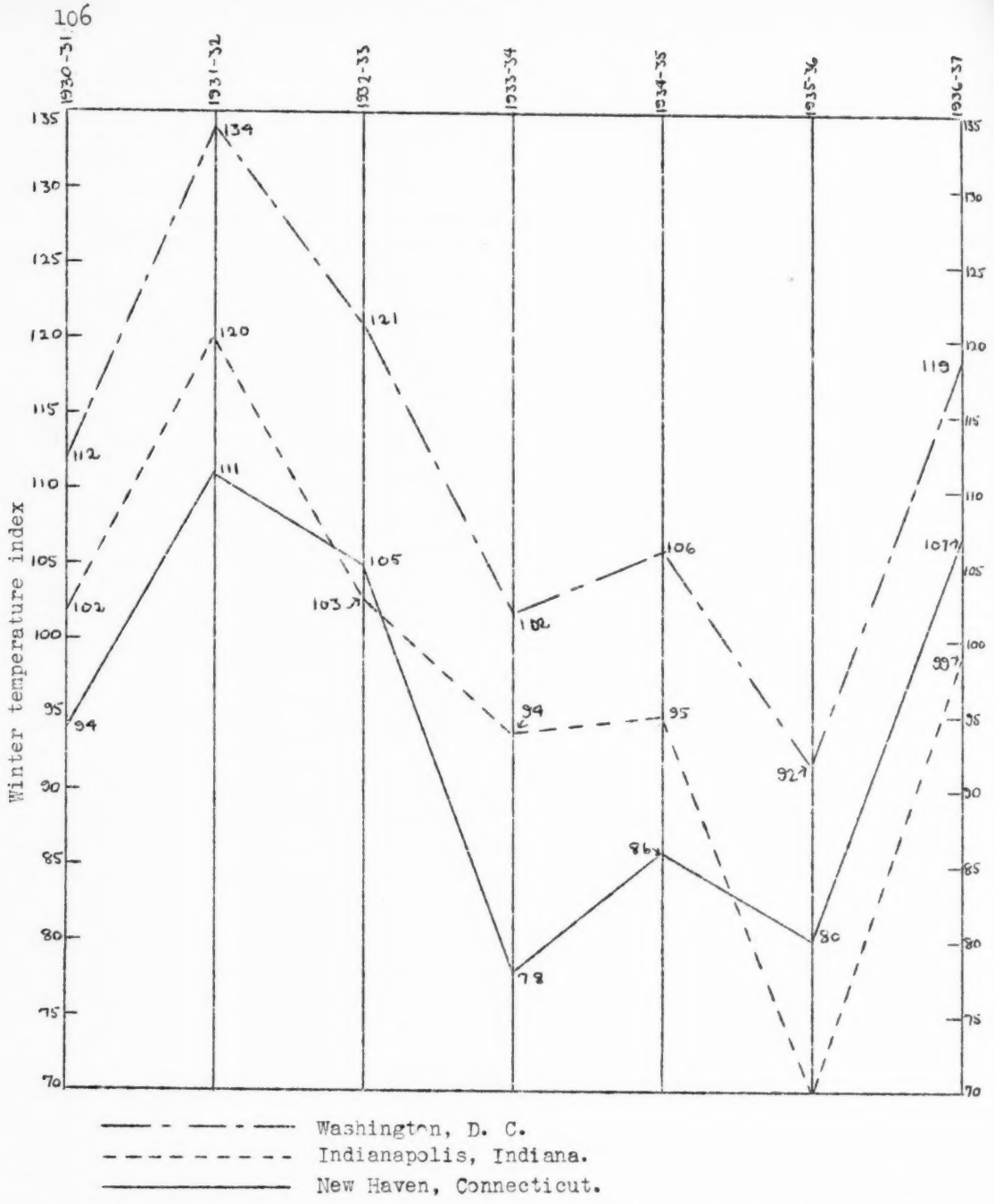

Fig. 12. Temperature indices of recent winters at Indianapolis, Indiana, Washington, D. C., and New Haven, Connecticut.

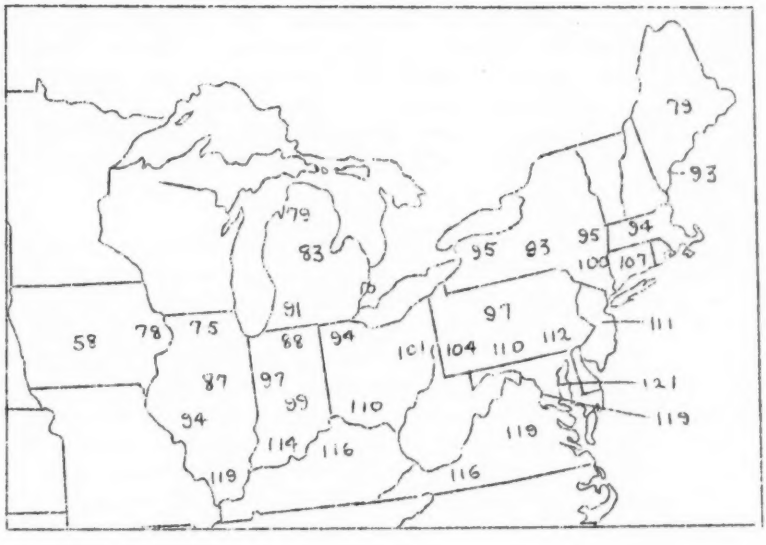

Fig. 13. Winter temperature indices for 1936-37.

above those of the winter of 1934-35. On the eastern seaboard, however, the temperature index was above 100 as far north as southern Connecticut, a condition approximating that of the winter of 1932-33.

On the basis of winter temperature alone, if the hypothesis now being tested is correct, there should be an observable increase, as compared with last year, in the incidence of bacterial wilt on susceptible varieties of sweet corn in the area between northern Virginia and southern Connecticut. It is probable also that if corn planting conditions are comparable, the disease will appear somewhat earlier. Unless one or both of these conditions is fulfilled, the hypothesis will have to be abandoned or modified. (University of Illinois).

TOBACCO DOWNY MILDEW DEVELOPMENTS TO DATE

E. E. Clayton

GEORGIA: On March 15, downy mildew (blue mold, Peronospora tabacina) had killed about 50 percent of the plants. The remainder were defoliated but recovering. Very little tobacco had been set out at this time and it would be some days before the defoliated plants could possibly be large enough to set. Weather favorable for mildew could be expected in Georgia as late as the first week in April, and consequently, the ultimate outcome still remains in doubt.

SOUTH CAROLINA: On March 17, mildew was present in some beds, but there has been no general spread of the disease. Plants were small generally, ranging in size up to a quarter. Reports since March 17 indicate that the disease is spreading rapidly. Temperature conditions in South Carolina have so far been too cool for maximum disease developments and with the small plants and warmer weather in prospect, a destructive outbreak is expected.

NORTH CAROLINA: On March 20, mildew was widely distributed through Columbus County and southeastern North Carolina and there was a very active spread of the disease during the short period from March 20 to 22. Plants were generally slightly smaller than in South Carolina, and hence, very easily killed by the disease. An extensive damage is consequently in prospect for this area. On March 23, numerous beds in Wilson County (eastern North Carolina) were inspected and no mildew was observed. In this area plants are very small and in many beds the stands are poor. The larger plants in early sown beds were destroyed by late freezes. In general, throughout the entire flue-cured area, growers sowed beds earlier than usual and the areas sown early were distinctly increased. Many growers planted from 50 to 100 square yards of bed for each prospective acre of tobacco. Prior to mildew, 25 yards was considered to be sufficient. Owing to the fact that during the past four years mildew has appeared just about the time the plants were ready to transplant, growers expected by early sowing to set out ahead of the disease. Last year it was possible to do this with the early beds. This year, late frosts either killed or greatly retarded the early plants and at the present time through much of the area, plants are smaller than usual for this season of year. On the other hand, mildew has appeared from three to four weeks early. Under these circumstances, severe mildew damage appears inevitable, but of course, at the present time no one can possibly estimate what the ultimate results will be. (Division of Tobacco and Plant Nutrition).

BRIEF NOTES

DEVELOPMENT OF THE APPLE SCAB FUNGUS IN INDIANA: In southern Indiana, ascospores of Venturia inaequalis were mature and ready to be discharged on March 21. From apple leaves collected on the above date in two places in southern Indiana, ascospores were discharged after a 10-12 hour period in a moist chamber. (P. C. Baines, Purdue University Agricultural Experiment Station).

RECENT LITERATURE: Two articles suggesting new or neglected viewpoints in the discussion of plant diseases have appeared recently. One is "Some Effects of Plant Diseases on Variability of Yields" by Carl Hartley and Annie Rathbun Gravatt in the February issue of Phytopathology,

pp. 159-171. The other is "Progressive Intensification of Uncontrolled Plant Disease Outbreaks" in the Journal of Economic Entomology for October 1936 (vol. 29, pp. 923-940) in which S. B. Fracker shows that the laws of the rate of increase of human populations are applicable to the rate of increase of infection in plant disease outbreaks as exemplified by white pine blister rust in stands of which the history is known.